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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/535,346	10/03/2005	Tadashi Ishikawa	52433/797	7148
26646 7590 11/15/2007 KENYON & KENYON LLP ONE BROADWAY NEW YORK, NY 10004				
EXAMINER				
SHEVIN, MARK L				
ART UNIT		PAPER NUMBER		
4116				
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11/15/2007		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/535,346

**Applicant(s)**

ISHIKAWA ET AL.

**Examiner**

Mark L. Shevin

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 May 2005.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-6 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 18 May 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO/CS-100)  
Paper No(s)/Mail Date 8 August 2006  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Status:***

1. Claims 1-6, filed 18 May 2006 as part of a preliminary amendment, are pending.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "low" in claim 1 is a relative term which renders the claim indefinite. The term "low" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably appraised of the scope of the invention. The Examiner is interpreting "low" to mean between 100 and 500 degrees, per claim 6.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. **Claim 1-6** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Statnikov** (US 6,338,765) in view of **Lu** (K. Lu, Nanocrystalline metals crystallized from amorphous solids: nanocrystallization, structure, and properties, *Materials Science and Engineering*, R16 (1996) p. 161-221.).

Regarding claims 1, 2, 6, Statnikov teaches a method of subjecting the surface layer of a metallic product (steel, bronze, welded bodies, see Abstract) to ultrasonic impact treatment (column 5, lines 23-40). Statnikov teaches that amorphous "white layers" (**claim 2**) are desirable and may be formed on the surface of a product depending on ultrasonic impact treatment parameters. These "white layers are formed on the treated body surface" (column 7, line 5) and are substantially devoid of grain structure and therefore amorphous (column 7, lines 20-31). Lastly Statnikov teaches that these white layers are desirable because they provide higher fatigue and corrosion resistance along with higher load carrying ability due to redistributed residual stresses (column 7, lines 25-31).

The Examiner assumes that Statnikov's method takes place at a "low temperature" as there is no indication of temperature; this usually indicates an

operation at room temperature. Furthermore the ultrasonic indenter used to effect ultrasonic impact treatment inherently "vibrates in a plurality of directions", necessarily towards surface of material to produce an impact and then away again to regain momentum (i.e. up and down).

Statnikov does not teach step 2, heat treatment to precipitate nanocrystals.

Lu teaches heat treatment as a basic principle for crystallizing ultrafine crystallites, in particular nanocrystals. The crystallization kinetics can be controlled by optimizing the heat treatment conditions including annealing temperature and time (p. 163, para 2, lines 1-4, **claim 6**). Lu also teaches that nanocrystalline materials often have superior mechanical properties compared to larger grained polycrystalline materials and amorphous materials in terms of ductility, strength, hardness, and diffusivity (p. 161, para 1, lines 6-12).

It would have been obvious to one of ordinary skill in the metallurgical arts at the time the invention was made to combine Statnikov in view of Lu to produce nanocrystalline surface layers through ultrasonic impact treatment and subsequent heating as Statnikov taught that the amorphous white layers were a product of ultrasonic impact treatment and Lu taught that in general an amorphous microstructure can be converted to a nanocrystalline structure through an appropriate heat treatment and that nanocrystalline microstructures often impart superior mechanical properties (compared to larger grains polycrystalline and amorphous materials). One would be motivated to combine Statnikov in view of Lu because Lu taught the specifics of how to produce

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nanocrystalline materials and the advantages of them above amorphous materials.

Regarding claim 3. Lu teaches that mechanical alloying (aka mechanical attrition) is a known way of producing nanocrystalline materials (p. 162, para 3, lines 4-9). Furthermore Lu points out that mechanical attrition (mechanical alloying) have been most commonly employed to produce large quantities of nanocrystalline samples up to now (p. 163, para 1, lines 1-7).

Regarding claim 4. Lu teaches that "[C]ontrolled crystallization of amorphous alloys can be used to obtain partially crystallized materials with nanometer-sized crystallites embedded in the residual amorphous matrix." (p. 164, para 2, lines 1-2). This crystal structure is advantageous in obtaining excellent mechanical or magnetic properties (p. 164, para 2, lines 2-4).

Regarding claim 5. it would have been obvious to one of ordinary skill in the metallurgical arts at the time the invention was made to shield the surface of a metallic material from air during ultrasonic impact treatment as shielding a surface from contact with air during a metallurgical treatment is a well known technique (see W Toman et al, Protective Gases, in *Ullmann's Encyclopedia of Industrial Chemistry*, Wiley-VCH Verlag GmbH & Co, online June 15 2000.) in the metallurgical arts and one would have a reasonable expectation of success in applying this known technique to a new process to avoid oxidation or other contamination as neither the technique nor the process would be altered by the combination.

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Regarding claim 6, Lu teaches both annealing temperature and time to be art recognized, result effective variables in transforming an amorphous microstructure to a nanocrystalline microstructure. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify either of these variables depending the crystallization kinetics and thus final microstructure desired. Alternatively, it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed ranges through process optimization, since it has been held that there the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

### ***Conclusion***

**Claims 1-6 are rejected**

**No claims are allowed**

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

8. **G. Liu et al.** Surface nanocrystallization of 316L stainless steel induced by ultrasonic shot peening. *Materials Science and Engineering A286* (2000) p. 91-95

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark L. Shevin whose telephone number is (571) 270-3588. The examiner can normally be reached on Monday - Thursday, 8:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on (571) 272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Mark L Shevin  
Examiner  
Art Unit 4116

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/Vickie Kim/  
Supervisory Patent Examiner, Art Unit 4116